

Carquinez Replacement Bridge Project

Report of Potential Construction Impediments Observed in the Maritime Archaeology Remote Sensing Survey and Ground Truthing Operations

**Prepared for:
Caltrans District 4
Oakland, California
and
Parsons Transportation Group
San Francisco, California**

**Prepared by:
William Self Associates
Orinda, California
December 1999**

Carquinez Straits - East

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Remote sensing survey

On October 14 1999, William Self Associates (WSA) conducted a side scan sonar and magnetometer survey in the Carquinez Straits to determine whether submerged cultural resources are present in the area. The survey was conducted in its entirety with 600 kHz side scan sonar and a Cesium magnetometer. Seventeen acoustic targets and six magnetic anomalies of possible cultural origin were identified in the remote sensing survey. Analysis of the remote sensing data determined that the material comprising the acoustic targets generated five of the six magnetic anomalies. The source of the remaining magnetic anomaly could not be determined. Fourteen of the targets were identified as being potential impediments to construction and may warrant consideration during source construction planning. This report provides the location and a brief description of those targets.

The locations and coordinates of the 14 potential construction impediments identified during the remote sensing survey are depicted in the appended map and table (Figures 1 and 2). As noted below, copies of side scan sonar records, and line drawings depicting the estimated configuration of several of the more noteworthy targets are appended as well.

Acoustic targets 2, 5, and 8 are not included in this report. In the analysis of the remote sensing data, target 2 was identified as a naturally formed irregularity in the bottom surface. Target 5 appears to be a small pile of debris located at the former western anchorage for the *Glomar Explorer*. Its proximity to the anchorage suggests the small deposit may be associated with that vessel, and is probably debris discarded when the *Explorer* was anchored there. Target 8 was identified as the rock fill used to cover the pipeline that crosses the Carquinez Straits, east of the Union Pacific Railroad Bridge. Targets 2, 5, and 8 were not investigated during ground-truthing operations.

Analysis of the remote sensing data also determined that of the 14 targets identified as potential construction impediments, one proved to be the anchor and cable of the green navigation buoy marking the edge of the deep-water channel, and two were identified as lengths of anchor cable lying on the bottom. WSA marine archaeologists conducted scuba dives on seven of the remaining acoustic targets.

The zero visibility water conditions prevalent at each target location precluded visual inspection of the targets. Target descriptions and interpretations are therefore based solely on tactile evaluation. In compliance with OSHA regulations, the diver conducting the evaluation was tethered and in constant voice contact with the dive platform via a two-way communication system. A standby diver was outfitted on the dive platform during all diving operations, as required.

Target 1

Acoustic target 1 was identified as the anchor and anchor cable for green buoy number #3, marking the north side of the Bulls Head Shipping Channel (Figure 3). It was not investigated.

Target 3

Acoustic target 3 is a rectangular, steel object that generates a magnetic signature of 1,775 gammas (γ). Although it was not possible to visually ascertain what the object is, tactile evaluation determined that it is probably fabricated from steel and measures approximately 65-feet in length and 12-feet in width (Figures 4 and 5). The object comprises a series of at least 12 rectangular boxes or cells, lying side-by-side, each of which measures 5-feet in length, 12-feet in width, and 6-feet in height. Each cell is separated from its neighbor by a space of approximately 9-inches. The cells are held in place by a length of 10-inch x 15-inch angle iron that runs along the length of each side of the object. A strip of 10-inch wide steel runs down the center of the rectangle, across the horizontal surface of each cell. The bottom of each cell - that is, the surface of the cell lying on the bottom sediment, appears to be solid, like the top.

A length of heavy steel cable is wrapped through two substantial "eyes," set perpendicular to each other and fastened to the horizontal surface of one of the cells. Projecting from the northwest side of the rectangle is a wood pole, approximately 10-inches in diameter. It may be intrusive and could possibly be a log that has become lodged in the wreckage. It was not possible to determine its length, but analysis of the sonar record suggests it may be 15-18 feet in length.

The 10-inch x 15-inch angle iron brace that runs along the eastern side of the rectangle projects beyond the last attached cell, suggesting a portion of the structure has broken off. An object

observed in one of the sonar records during subsequent ground truthing operations appears to be a portion of one of the cells, perhaps one that broke off from this end (see target 11 and Figure 15). Subsequent ground truthing of target 11 confirmed it could possibly be such a piece of the wreckage.

Targets 4 & 7

Acoustic target 4 is an anchoring device with a length of attached cable that runs along the bottom of the Strait towards the west for a distance of approximately 150-feet. At its western end, the cable is attached to an object identified as target 7. It appears to be a sunken navigation buoy. The target is approximately 15-feet in height with a small counterweight attached to the bottom (Figures 6, 7, and 7a). Metal flanges or “sails” project from its opposite end. The target did not generate a magnetic signature, which is consistent with an object fabricated from aluminum, as a buoy would be. The mass of target 7 projects above the bottom surface approximately 5-feet.

Target 6

Acoustic target 6 appears to be at least one, and possibly two, lengths of anchor cable lying partially buried beneath the surface of the bottom sediments. The target has a magnetic signature of 400γ. The cable may be looped around itself, or it may be two distinct pieces. One length measures approximately 65-feet in length, the other measures approximately 10-feet in length. This target was not investigated during the ground truthing operation (Figure 8).

Targets 9 & 10

Acoustic target 9 comprises three linear objects that generate a magnetic signature of 1,975γ. The westernmost object is approximately 22-feet in length and projects above the bottom surface approximately 3-feet. Two linear objects are situated to the east, one of which is approximately 35-feet in length; the other is approximately 45-feet long. The latter two project above the bottom surface approximately 3.5-feet (Figure 9).

Target 10 is a similar type of linear object. It is approximately 25-feet in length, projects above the bottom surface approximately 2.5 feet, and generates a magnetic signature of a 475γ. Targets 9 and 10 are probably abandoned or lost lengths of dredge pipe (Figure 10).

To the southeast and immediately adjacent to these two targets is an array of wood piles associated with an abandoned pier that once projected from the south shore of the Carquinez Straits. Although not submerged impediments, as a point of information these piles should be avoided until they have been properly assessed. Such an assessment will be conducted in May 2000 (refer to Figure 1).

Magnetic Target 1

Magnetic target 1 has a signature of 500γ and lies approximately 500-feet west of acoustic/magnetic target 3 (refer to Fig 1). The surficial expression of the target is very subtle and it was not observed in the initial side scan sonar survey. The target was therefore initially classified as a magnetic target only, and not an acoustic target. It was not until the ground truthing phase, when the location of the target's magnetic signature was reexamined, that the configuration of the target was observed in the sonar record. The target appears to consist of two components, separated by approximately 40-feet. The western component is a large ball of stud-link anchor chain approximately 3-feet in diameter, with approximately 5-feet of chain trailing off to the west. Each link of the chain appeared to be approximately 10-inches long and 2.5-inches thick. The eastern component of magnetic target 1 appears to be a length of cable or chain approximately 20-feet long. The two components may actually be one long length of chain that is largely covered by the bottom sediments and exposed only at either end (Figure 11).

Magnetic Target 2

A magnetic anomaly measuring 225γ was observed approximately 600-feet northeast of the existing Union Pacific Railroad bridge. Although six passes with the 600 kHz side scan sonar were made over the target, each at different range scales, no surficial evidence of the anomaly's source could be observed in the acoustic data. A mass of ferrous material approximately 200 pounds in size would generate such an anomaly. Since no visual evidence of the source could be

obtained, it is assumed that an object of approximately that size lies buried beneath the bottom sediments at this location.

Magnetic Target 3

This target generates a magnetic signature of approximately 250γ and lies approximately 300-feet north of debris field 4. It appears to be a length of cable approximately 75-feet long. The surficial expression of the target is very subtle and it was unobserved in the initial side scan sonar survey. The target was therefore initially classified as a magnetic target only, and not an acoustic target. It was not until the ground truthing phase when the location of the target's magnetic signature was reexamined that the configuration of the sinuous cable was observed in the sonar record (Figure 12).

Debris Fields

Analysis of the side scan sonar data suggested the presence of five wide-spread deposits of cultural material. These did not appear as discrete, isolated targets but rather had the appearance of spatially non-discrete debris fields. Based on the small size of their constituents and their wide-spread configuration as observed in the remote sensing data, two of the debris fields (numbers 1 and 5) were eliminated from further consideration as either potentially coherent cultural deposits or potential construction impediments. The remaining three debris fields were examined during ground-truthing operations.

Debris Field 2

This scatter of cultural material appeared to be composed of at least five discarded tires and several pieces of isolated debris that appeared to be discarded automobile parts. No other cultural material could be found during the tactile investigation of the bottom sediment (Figure 13).

Debris Field 3

Examination of this debris field revealed that a scatter of small to medium-size sheets of metal lie interspersed below and on top of a segment of steel cable that appeared to be approximately

5-inches in diameter. The cable is looped back upon itself and is partially buried in the bottom sediments. The straight, exposed portion of the cable appears to be approximately 25-feet long (Figure 14).

Target 11

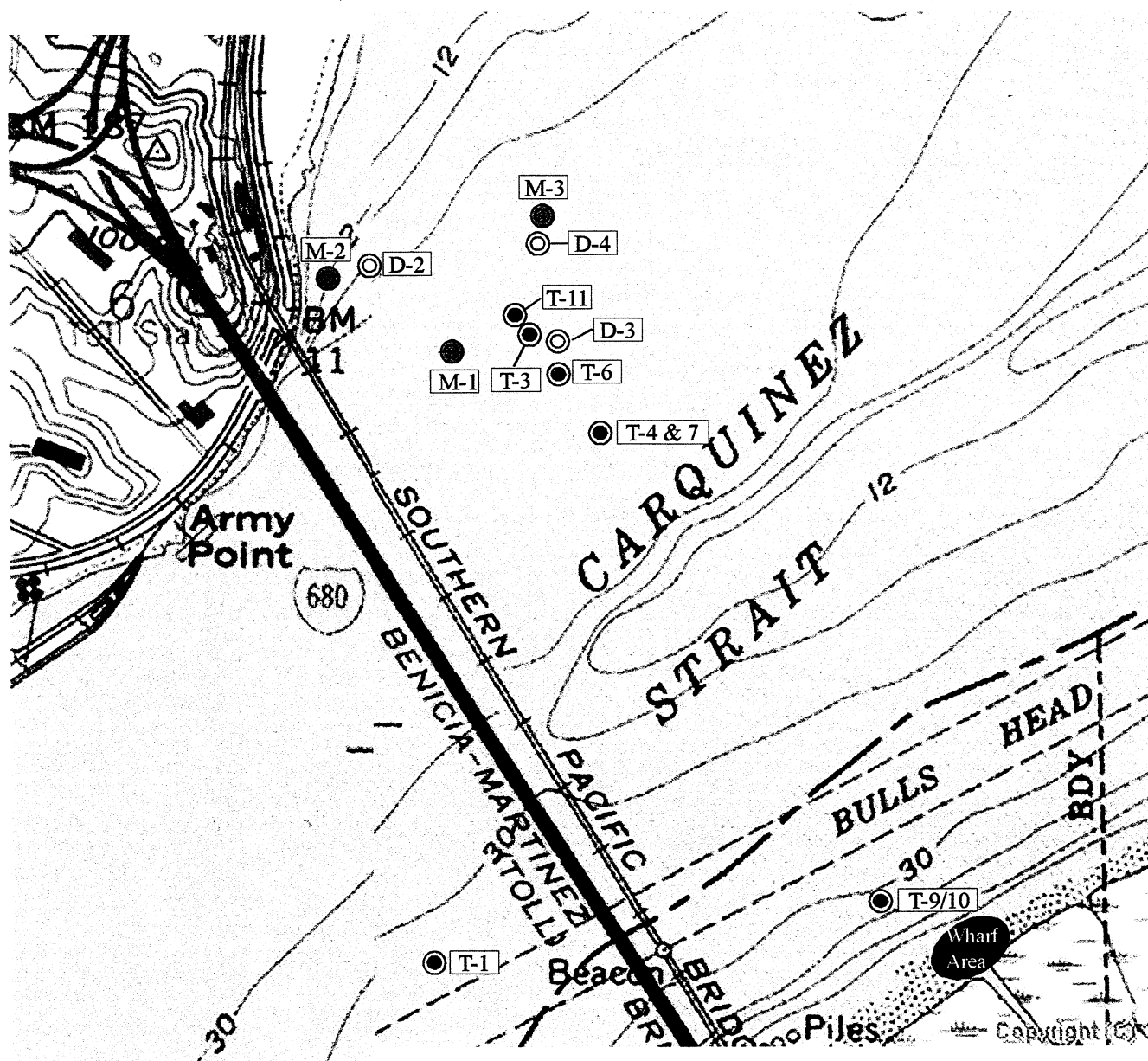
During the side scan sonar survey of debris field 3, a previously unobserved rectangular object was identified immediately adjacent to the scatter of debris that constituted the debris field. Examination of the acoustic data and a subsequent ground-truthing investigation of the target determined that target was a trapezoidal-shaped metal object that appeared to be fabricated of steel plating. Designated as Target 11, the object appeared to be approximately 5-feet wide and 4-to-5 feet in height. Its close proximity to target 3 and the similarity of size and shape suggest it is a portion of target 3 that broke free (Figures 15 and 15a).

Debris Field 4

The debris comprising this field comprised a variety of metal blocks, steel plates, and a number of unidentifiable metal parts, wood fragments, at least one tire, and a solid, circular metal object, approximately 18-inches in diameter, with projecting metal teeth. The edges of the teeth are ridged and the inside surfaces are concave. Its exact nature and function could not be determined (Figure 16).

APPENDIX

Figures 1 - 16

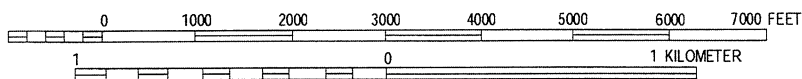


- T-n = Location and number of acoustic and magnetic target
- M-n = Location and number of magnetic anomaly
- D-n = Location and number of debris field



BENICIA, CALIF.
1959 (1980)

VINEHILL, CALIF.
1959 (1980)



CONTOUR INTERVALS 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

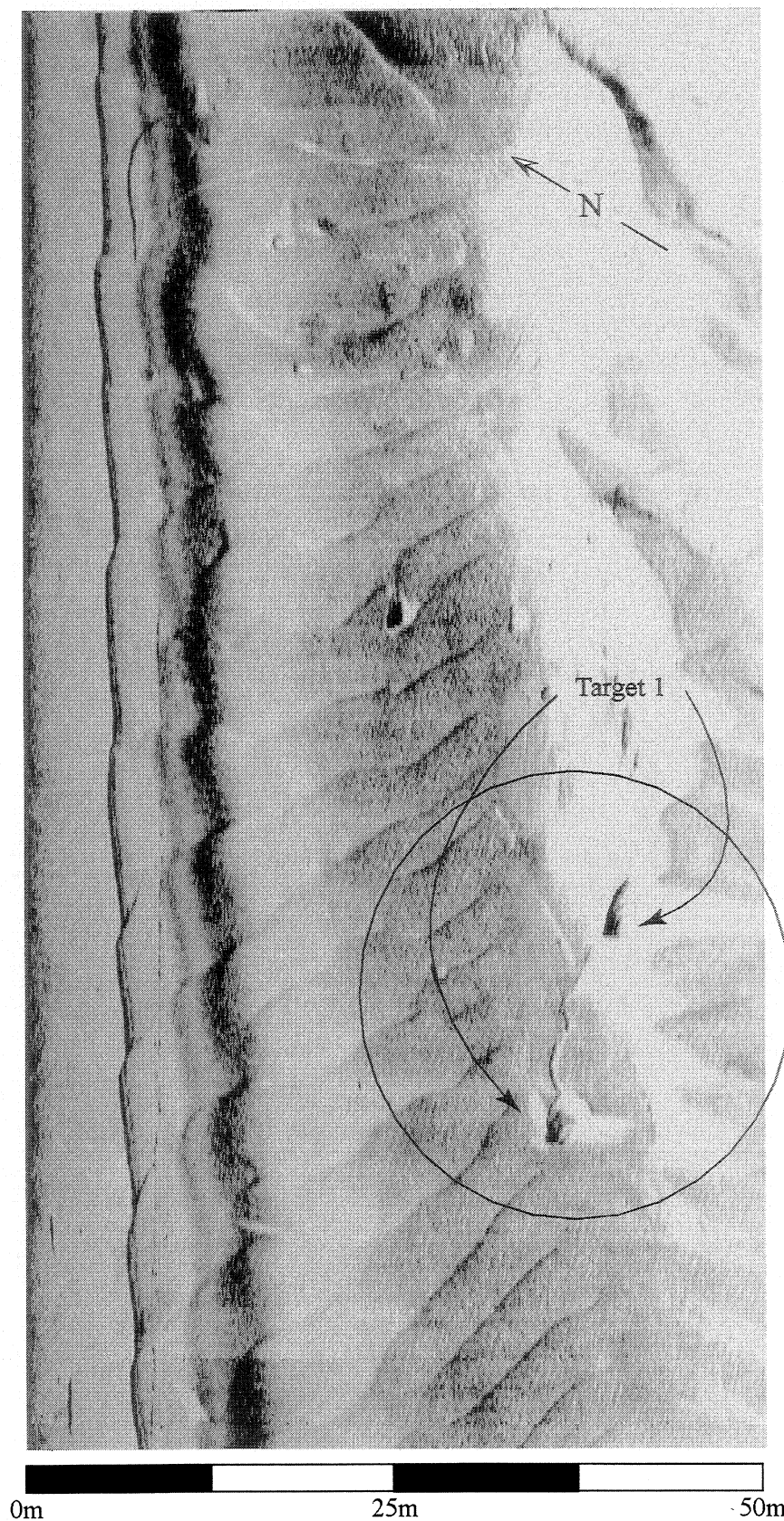
Figure 1

Acoustic and Magnetic
Target Locations

Carquinez Straits - East

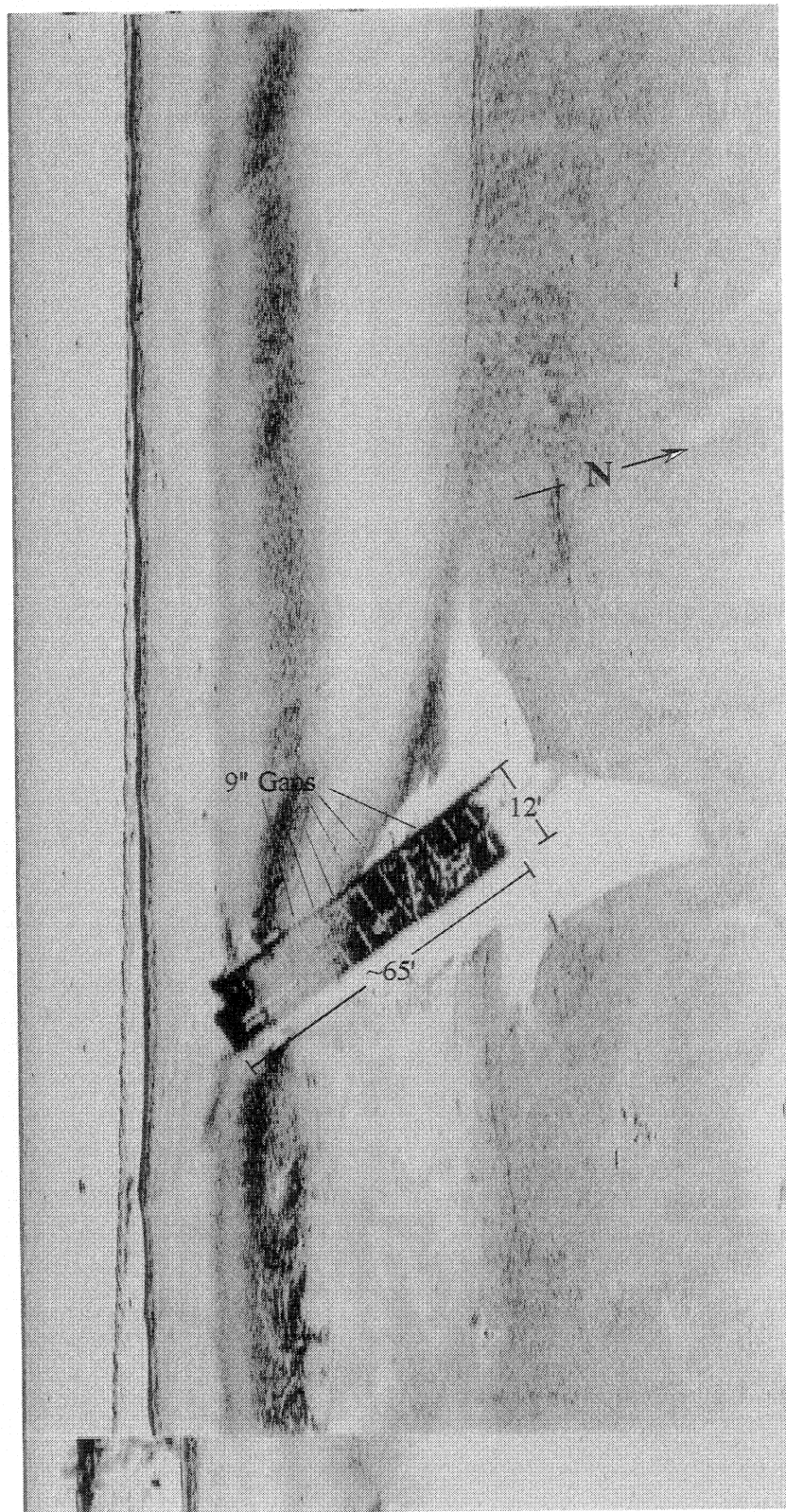
Figure 2: Carquinez Straits-East: Locations of Possible Construction Impediments

Latitude	Longitude	Description
38d 02.280	122d 07.421	Anchor and cable for green buoy number 3.
38d 02.829	122d 07.314	65-ft x 12-ft x 6-ft rectangular steel object.
38d 02.774	122d 07.244	Anchor, chain, and sunken navigation buoy.
38d 02.790	122d 07.259	Two lengths of anchor cable or chain, one measures 65-ft in length, the other measures approximately 10-ft.
38d 02.319	122d 06.918	Three linear targets, 20-45-ft in length, probably three lengths of abandoned dredge pipe.
38d 02.863	122d 07.406	Large ball and length of large, stud-link anchor chain. May be 60-ft in length.
38d 02.959	122d 07.527	Magnetic anomaly has no surficial expression.
38d 02.942	122d 07.273	Length of cable or chain, approximately 75-ft. in length.
38d 02.907	122d 07.494	Scatter of tires, auto parts.
38d 02.805	122d 07.245	Length of 5-inch diameter cable with associated sheets and fragments of metal.
38d 02.840	122d 07.321	Trapezoidal-shaped metal object fabricated from steel plating. Probably a portion of target 3 that broke free.
38d 02.910	122d 07.282	Metal blocks, steel plates, unidentifiable metal parts.



Acoustic Target 1
(600 kHz View from Starboard Channel)

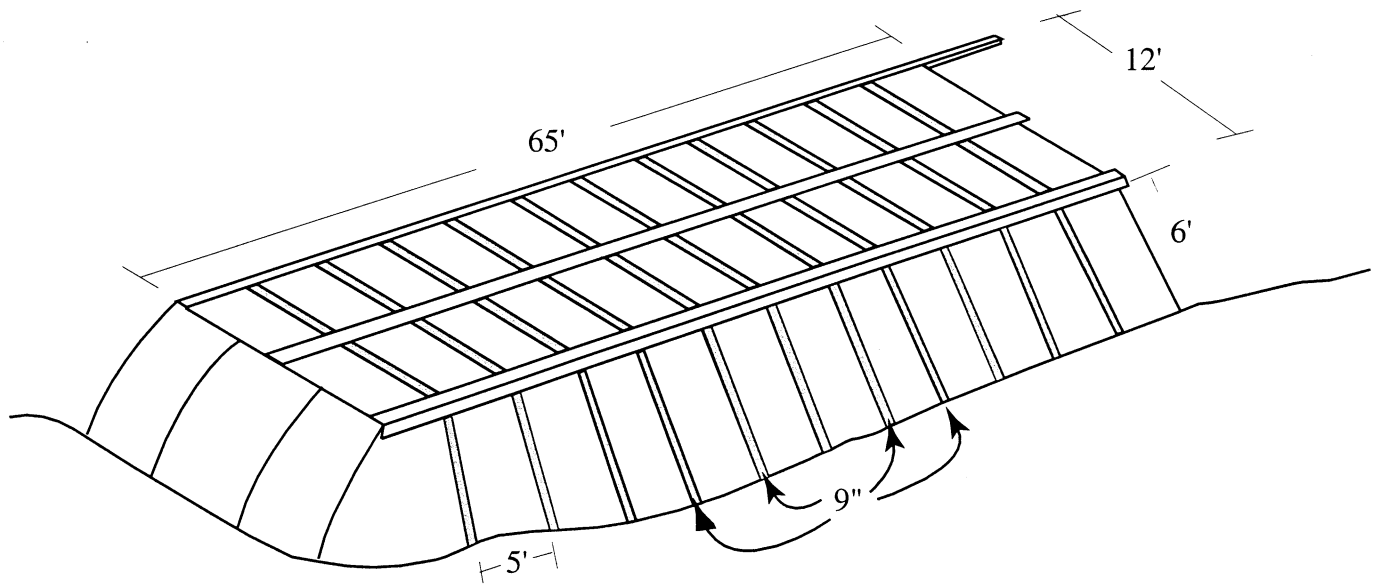
Figure 3
Carquinez Straits Potential
Construction Impediments



0m 25m 50m

Acoustic Target 3
(600 kHz View from Starboard Channel)

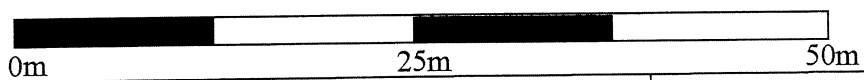
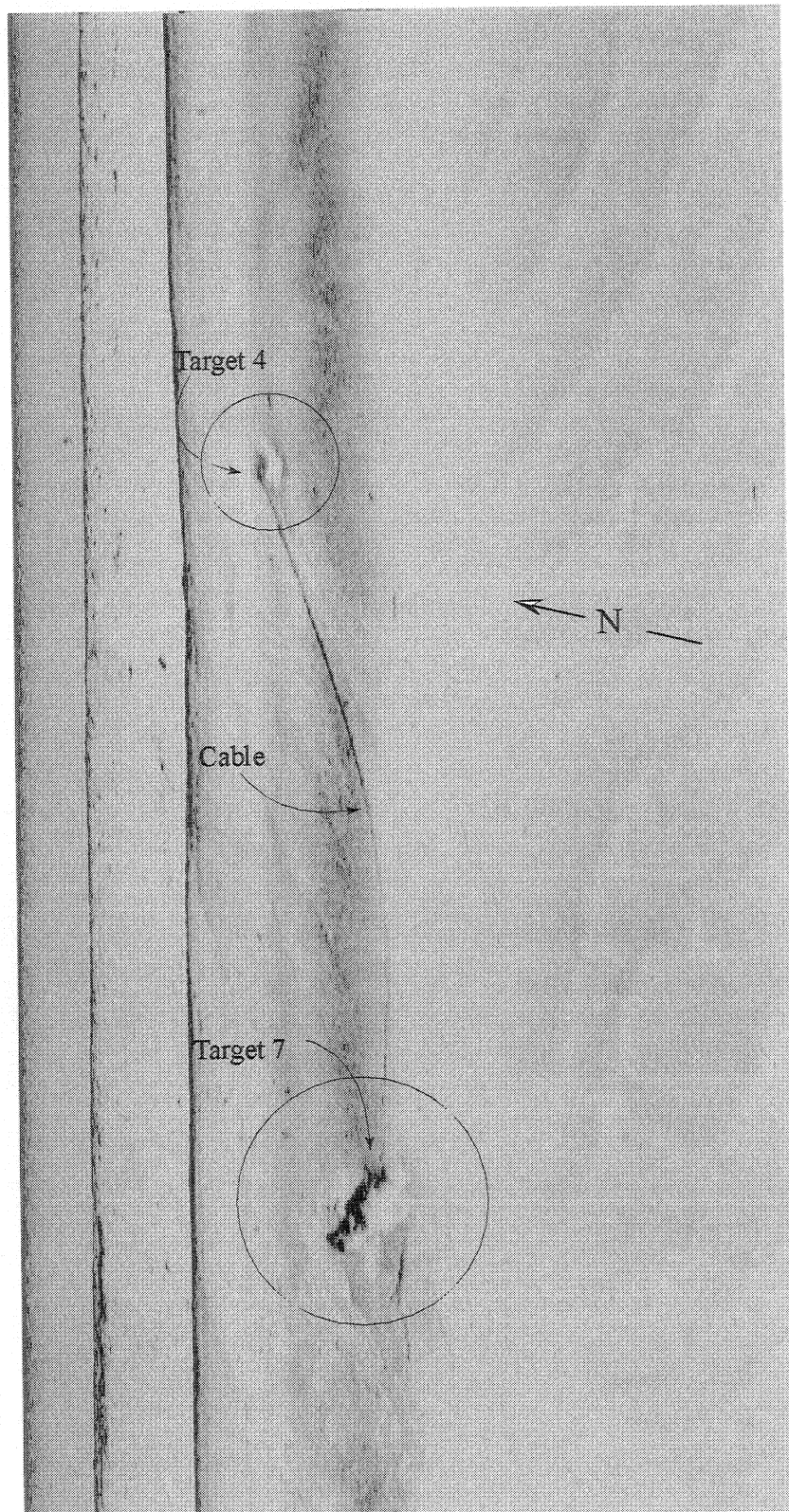
Figure 4
Carquinez Straits Potential
Construction Impediments



Not to Scale

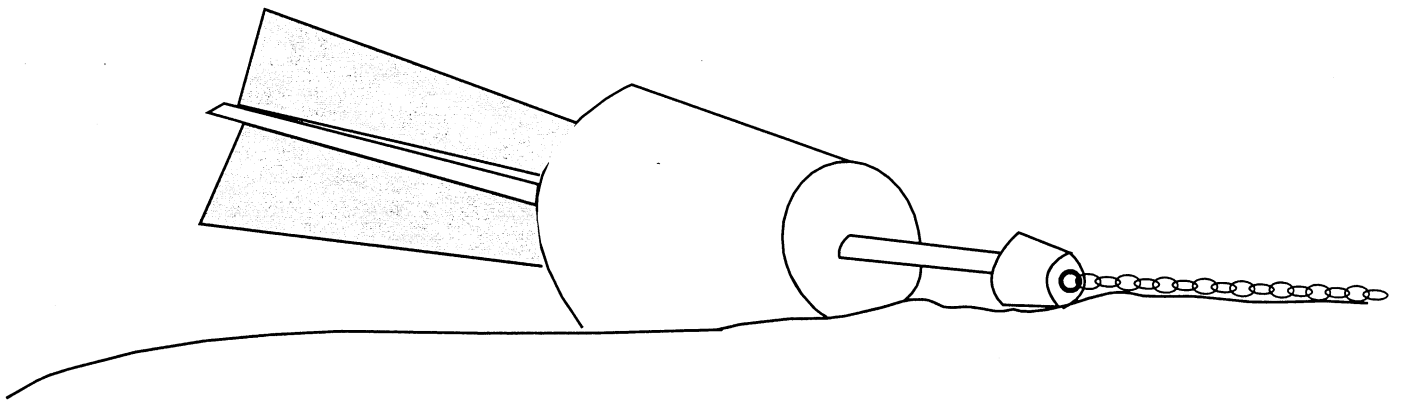
Perspective Drawing of Acoustic Target 3

Figure 5
Carquinez Straits Potential
Construction Impediments



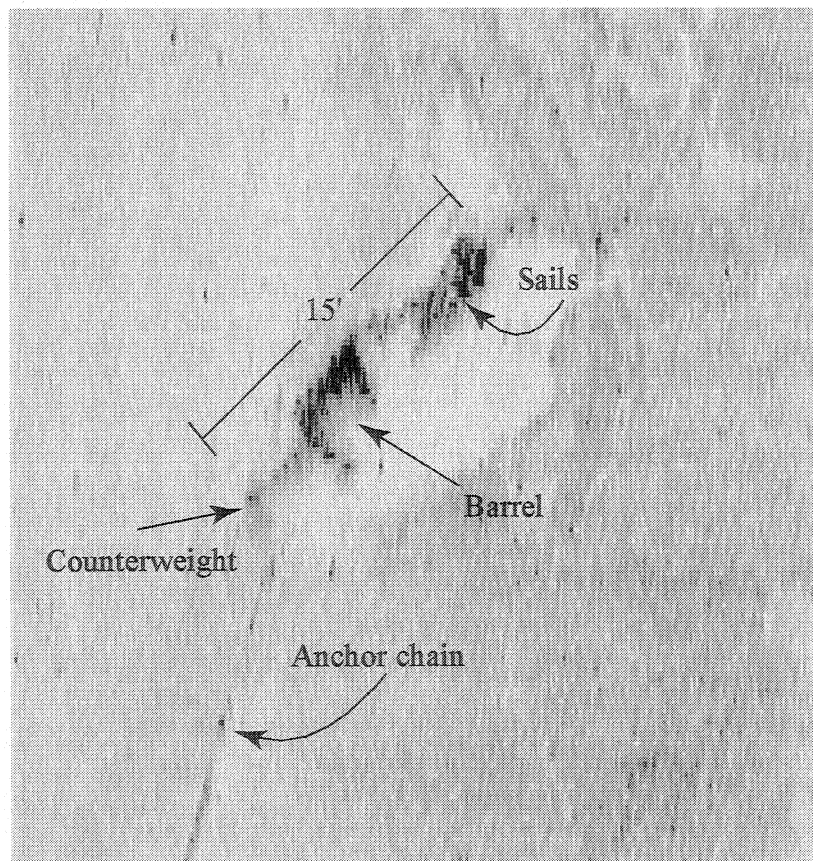
Acoustic Targets 4 and 7
(600 kHz View from Starboard Channel)

Figure 6
Carquinez Straits Potential
Construction Impediments



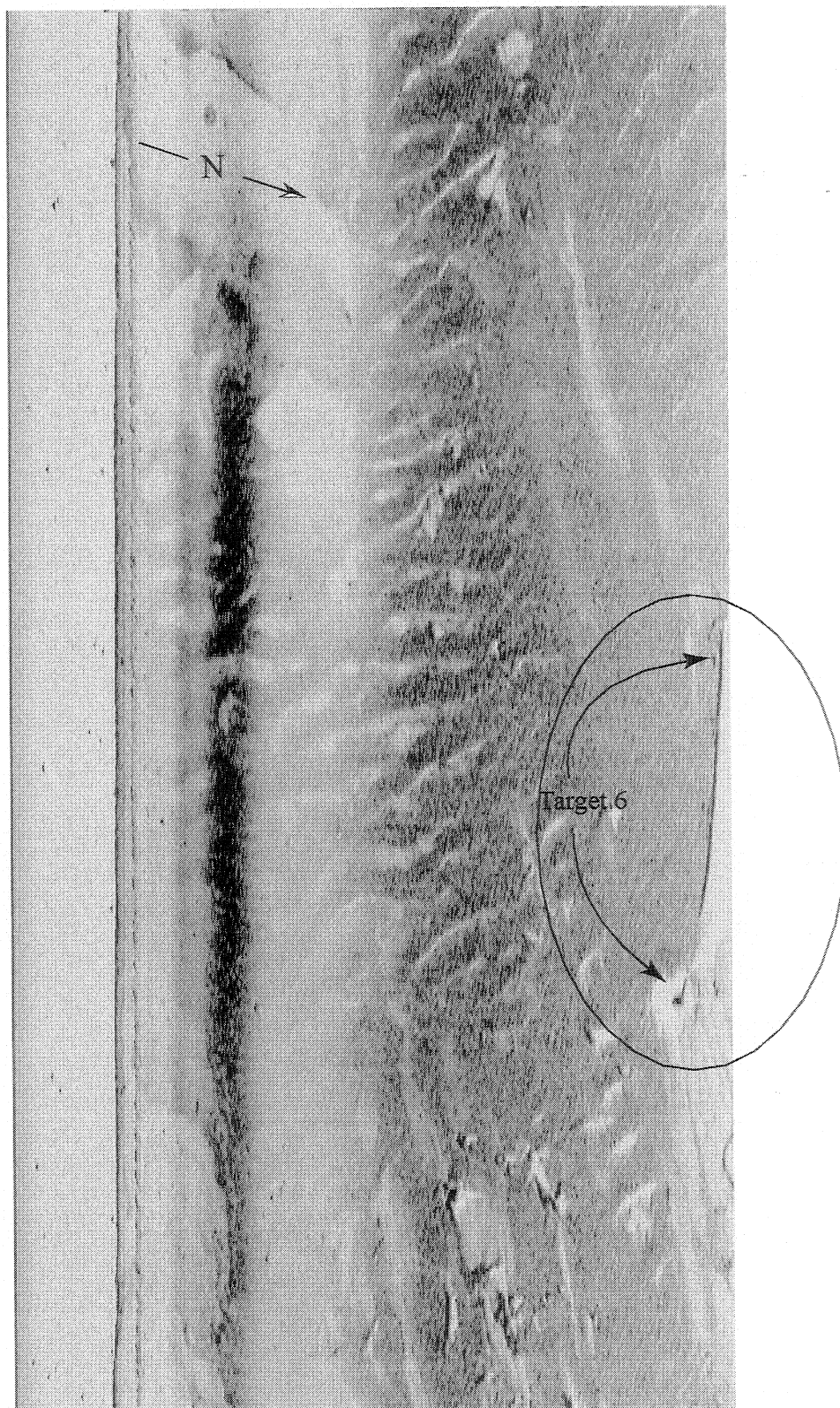
Perspective Drawing of Acoustic Target 7

Figure 7
Carquinez Straits Potential
Construction Impediments



Detail: Acoustic Target 7
(600 kHz View from Starboard Channel)

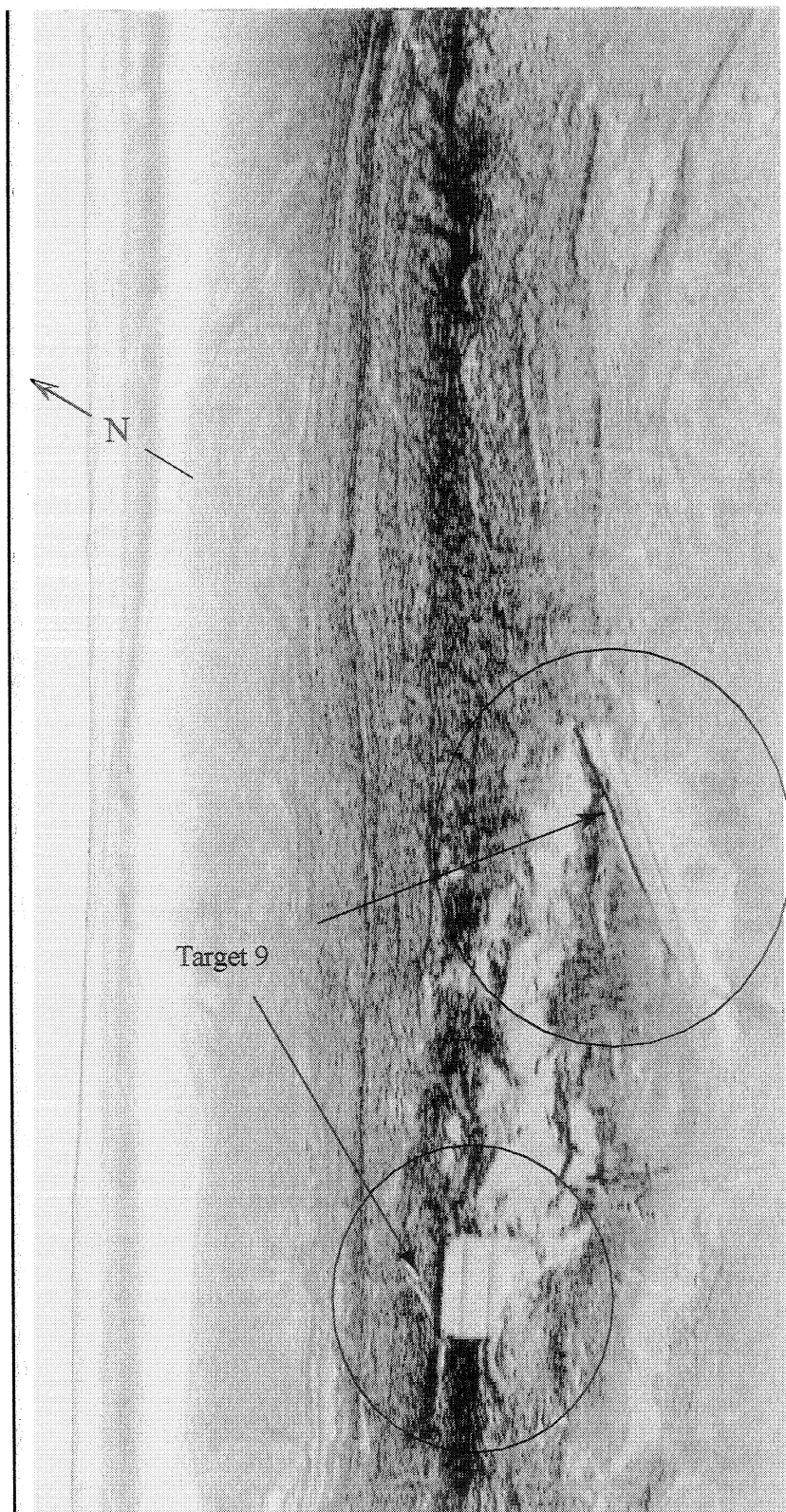
Figure 7a
Carquinez Straits Potential
Construction Impediments



0m 25m 50m

Acoustic Target 6
(600 kHz View from Starboard Channel)

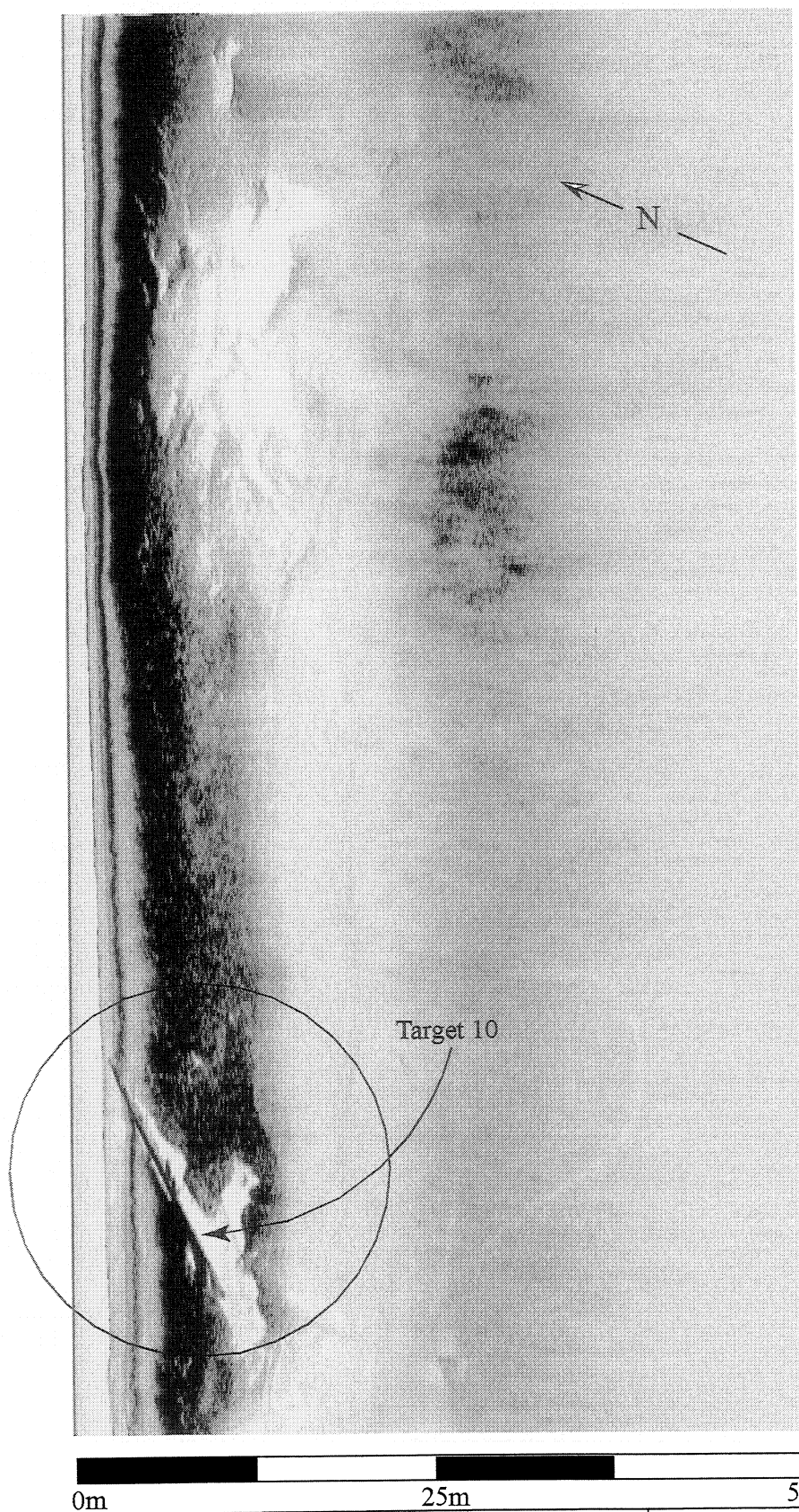
Figure 8
Carquinez Straits Potential
Construction Impediments



0m 25m 50m

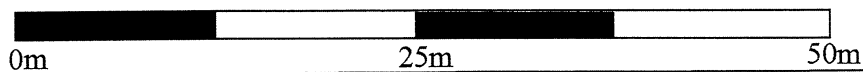
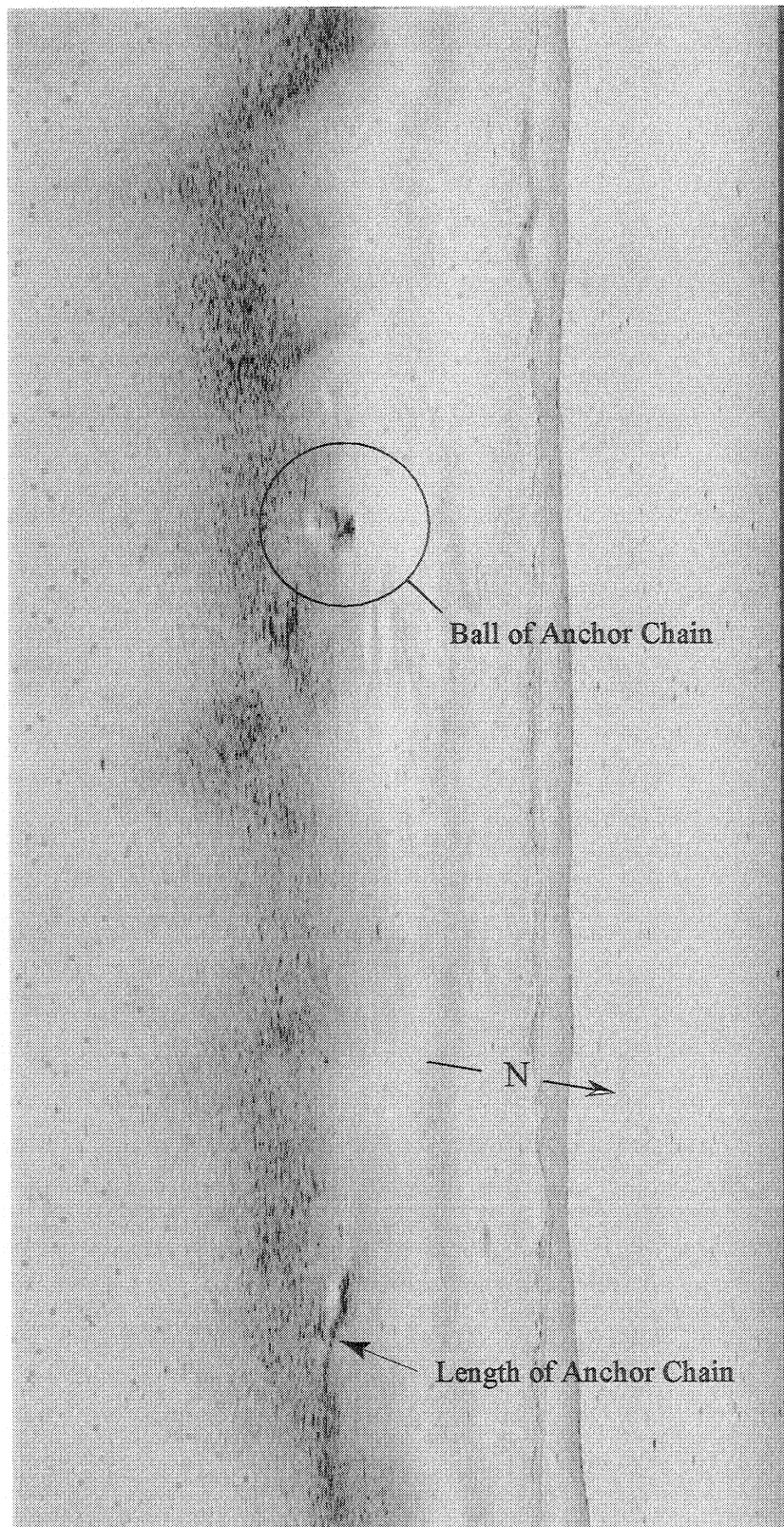
Acoustic Target 9
(600 kHz View from Starboard Channel)

Figure 9
Carquinez Straits Potential
Construction Impediments



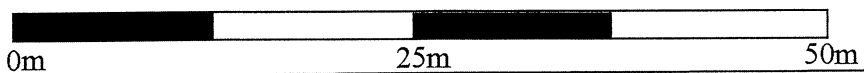
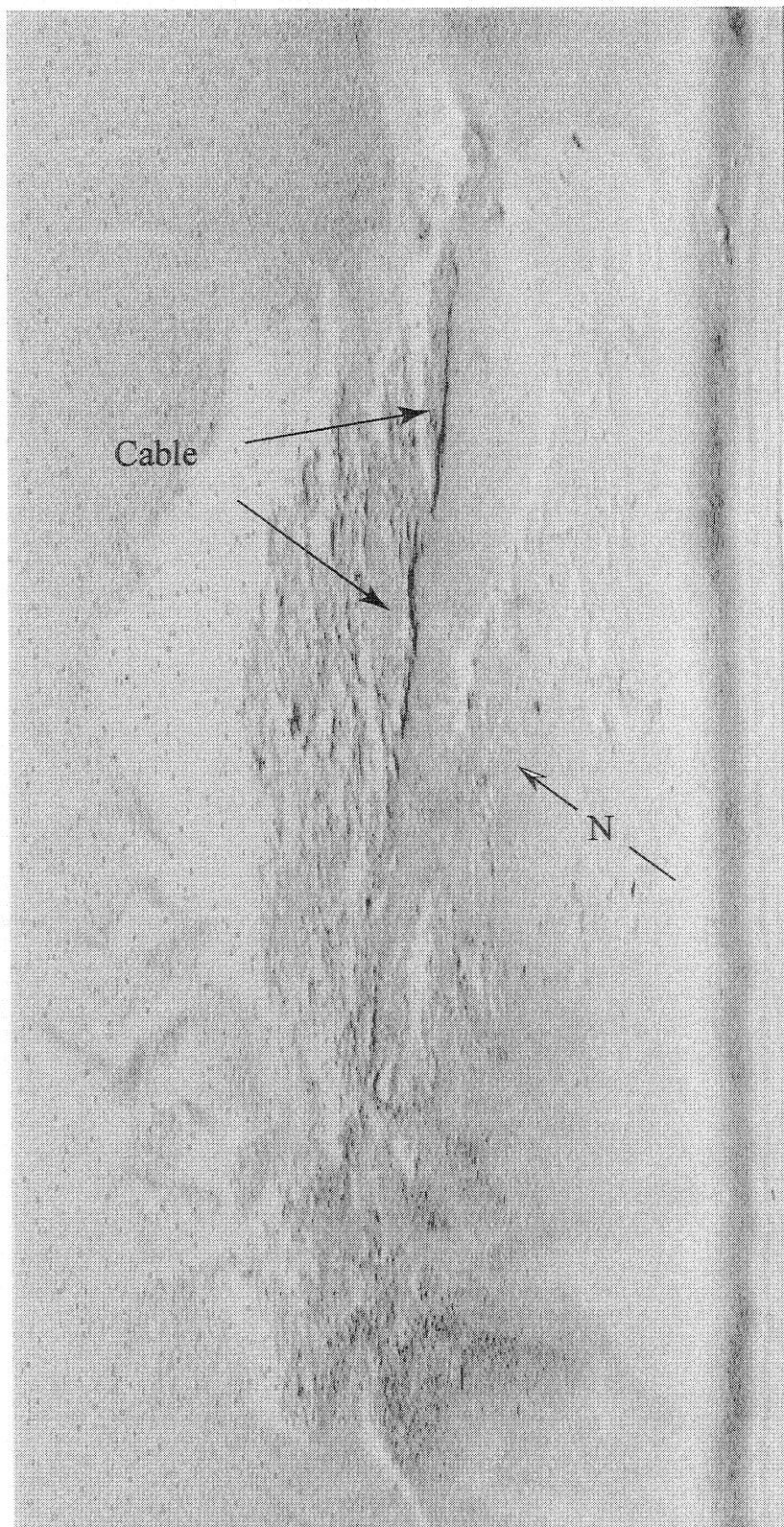
Acoustic Target 10
(600 kHz View from Starboard Channel)

Figure 10
Carquinez Straits Potential
Construction Impediments



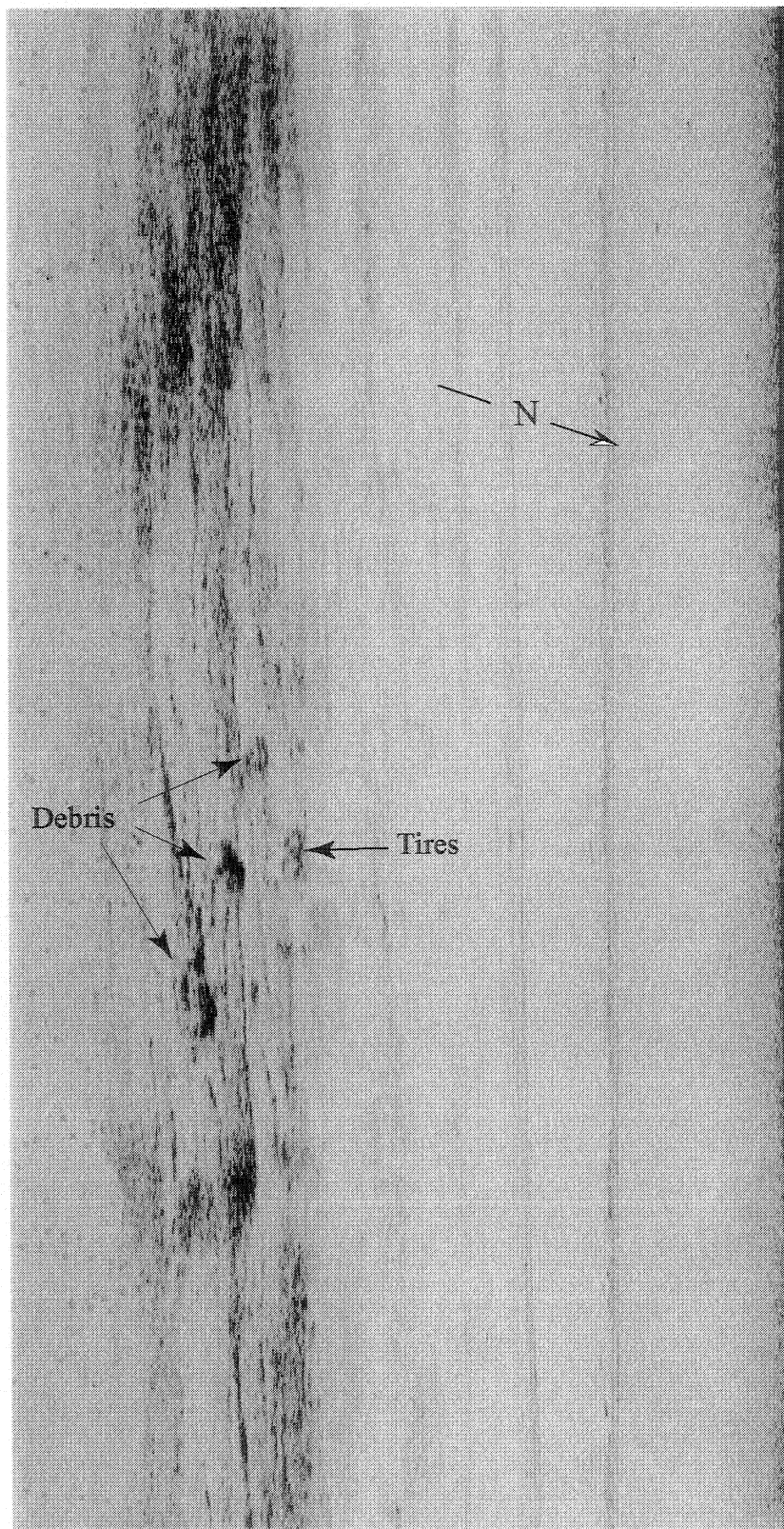
Magnetic Target 1
(600 kHz View from Port Channel)

Figure 11
Carquinez Straits Potential
Construction Impediments



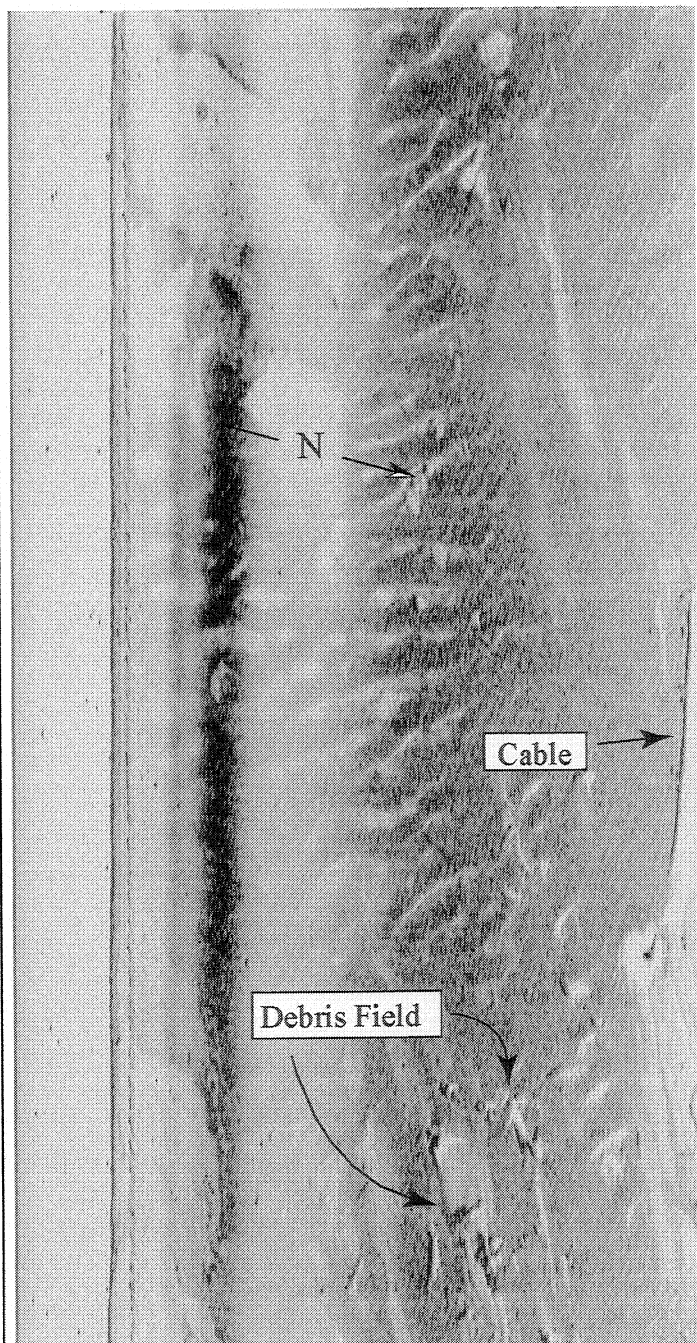
Magnetic Target 3
(600 kHz View from Port Channel)

Figure 12
Carquinez Straits Potential
Construction Impediments

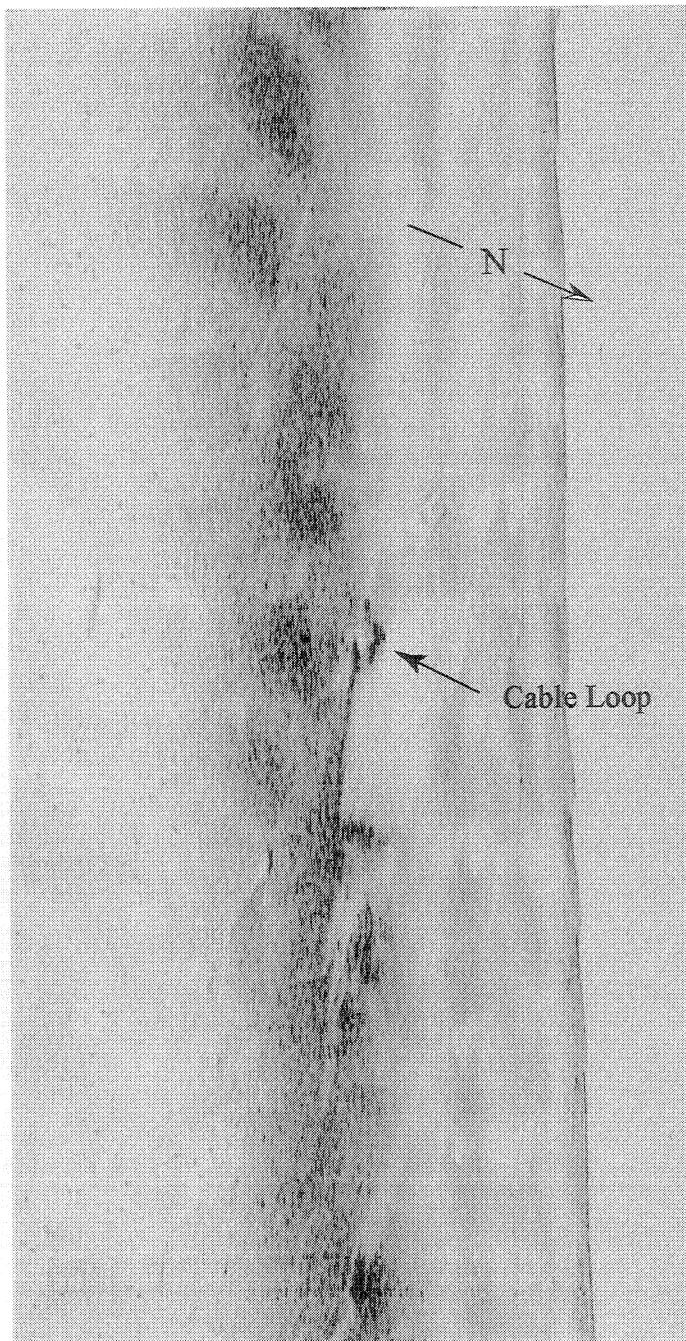


Debris Field 2
(600 kHz View from Port Channel)

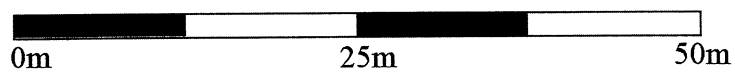
Figure 13
Carquinez Straits Potential
Construction Impediments



Starboard Channel-50m Range Scale

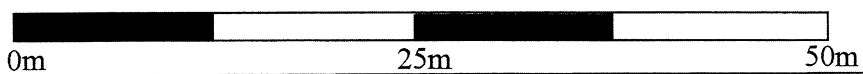
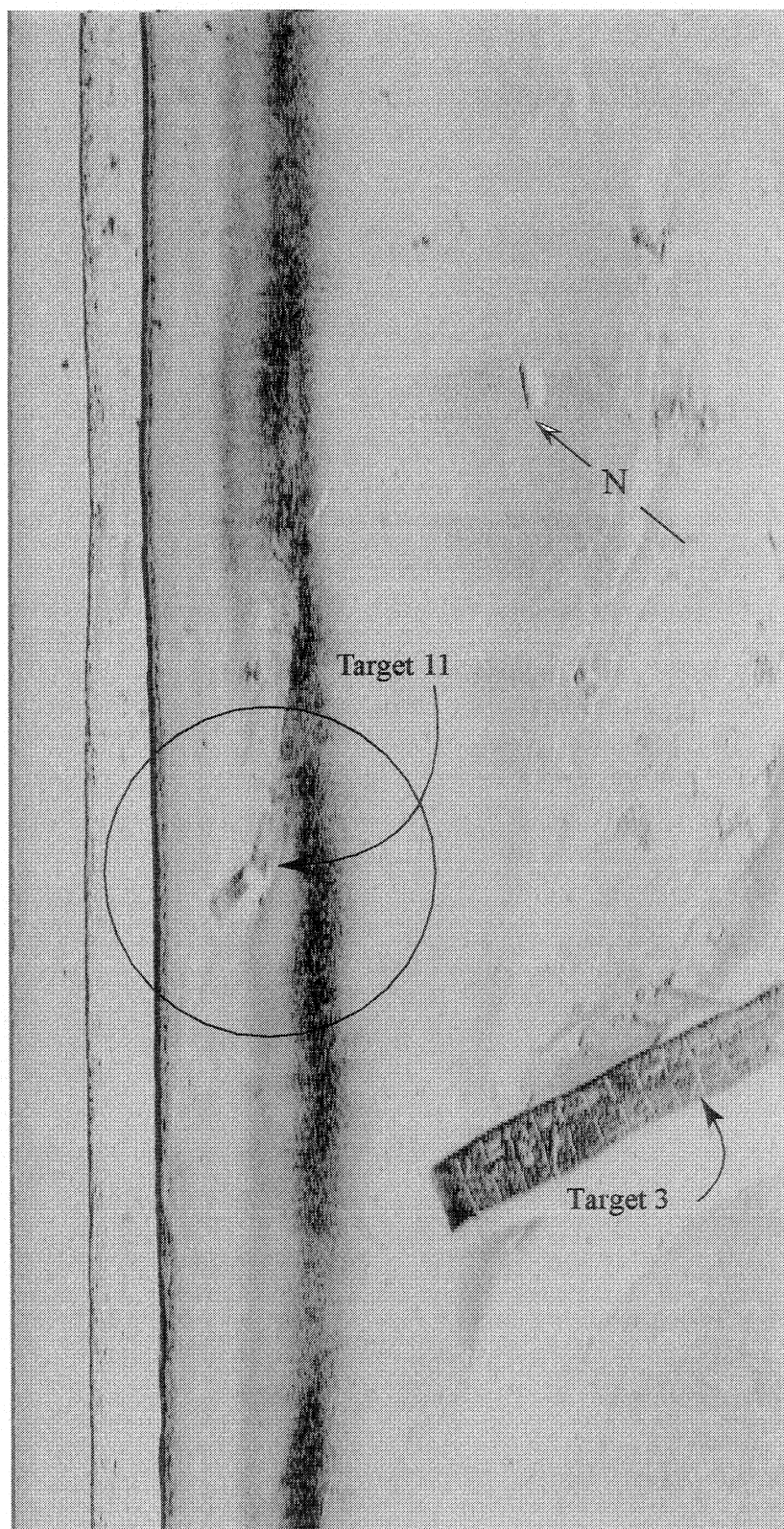


Detail of Cable
Port Channel-20m Range Scale



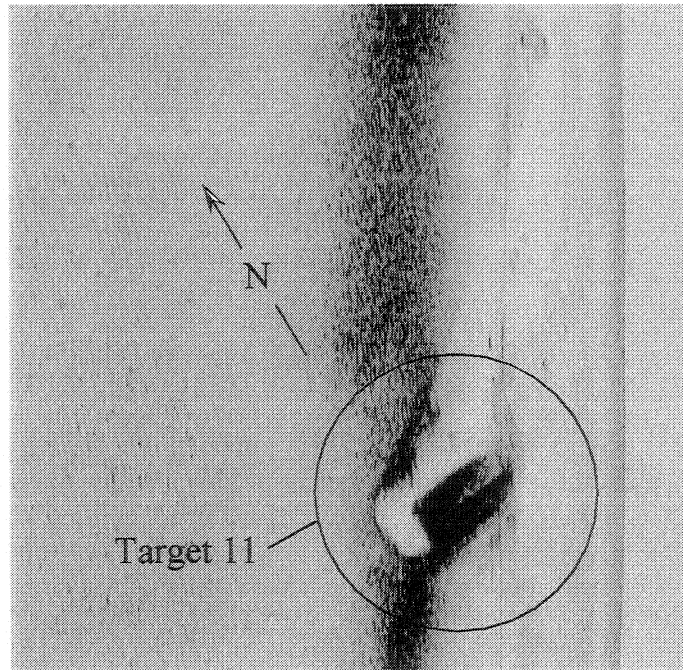
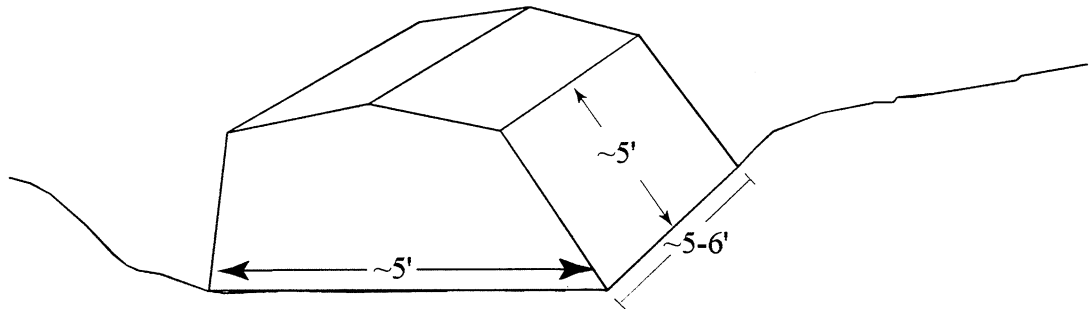
Debris Field 3
(600 kHz View)

Figure 14
Carquinez Straits Potential
Construction Impediments



Acoustic Target 11
(600 kHz View from Starboard Channel)

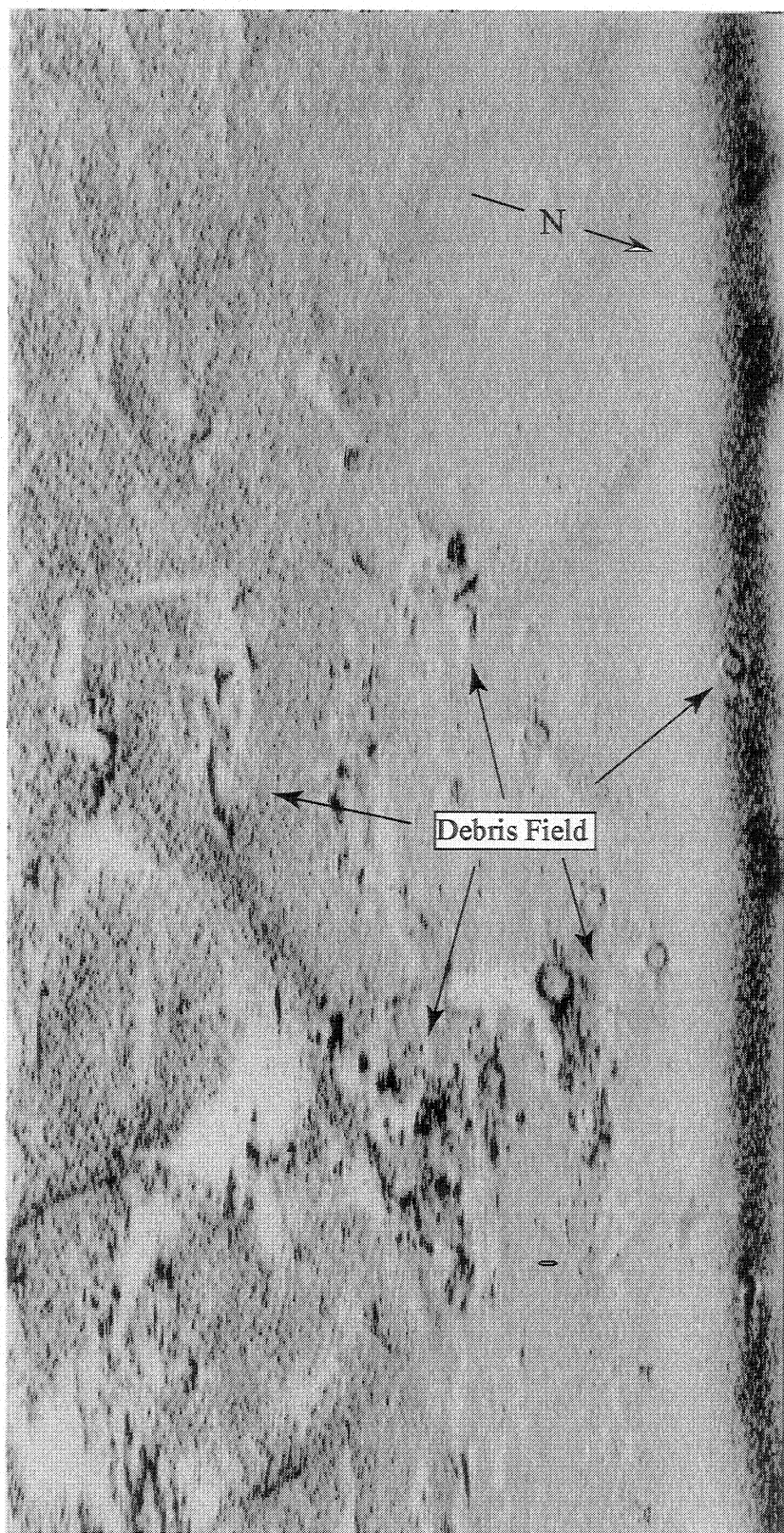
Figure 15
Carquinez Straits Potential
Construction Impediments



600 kHz Port Channel

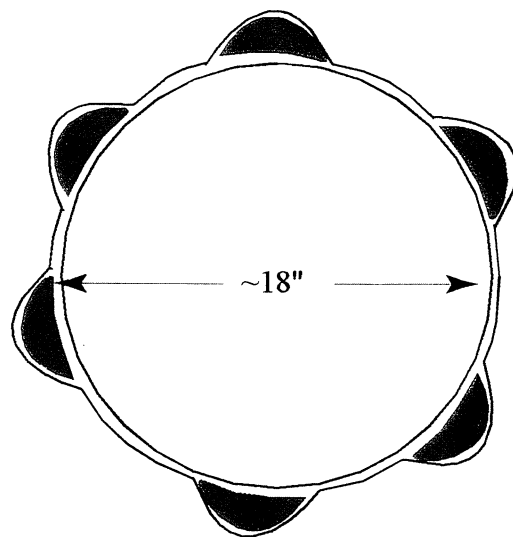
Perspective Drawing and Detail of Acoustic Target 11

Figure 15a
Carquinez Straits Potential
Construction Impediments



0m 25m 50m

Debris Field 4
(600 kHz View from Port Channel)



Detail of Circular Object

Figure 16
Carquinez Straits Potential
Construction Impediments